



FCC Verification Test Report

Issued date: Nov. 24, 2016

Project No.: 16Q102101

Product : Network Camera

Model : FD816CA-HF2

Applicant : VIVOTEK INC.

Address : 6F, No.192, Lien-Cheng Rd., Chung-Ho, New Taipei City, 235,
Taiwan, R.O.C.

Report No: WD-EF-R-160167-00

According to

47 CFR FCC Part 15, Subpart B, Class B
ICES-003:2016 Issue 6, Class B

ANSI C63.4:2014

Technical Engineer : Evan Cheng / Evan Cheng

Authorized Signatory : Ken Huang / Ken Huang



Wendell Industrial Co., Ltd
Wendell Electronic Test Laboratory

Add: 6F/6F-1, No.188, Baoqiao Rd., Xindian Dist., New Taipei City 23145, Taiwan R.O.C.



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History of this test report

Report No.	Issue date	Description
WD-EF-R-160167-00	Nov. 24, 2016	Initial Issue

Declaration

This report is for your exclusive use. Any copying or replication of this report to or for any other person or entity, or use of our name or trademark, is permitted only with our prior written permission. This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product unless specifically and expressly noted. Our report includes all of the tests requested by you and the results thereof based upon the information that you provided to us.



History of supplementary report

Report No.	Issue date	Description
WD-EF-R-160167-00	Nov. 24, 2016	Original report

Declaration

This report is for your exclusive use. Any copying or replication of this report to or for any other person or entity, or use of our name or trademark, is permitted only with our prior written permission. This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product unless specifically and expressly noted. Our report includes all of the tests requested by you and the results thereof based upon the information that you provided to us.



1 Certification

Product: Network Camera

Brand Name: VIVOTEK

Model No: FD816CA-HF2

Applicant: VIVOTEK INC.

Tested: Oct. 28 ~ Nov. 01, 2016

Standard: 47 CFR FCC Part 15, Subpart B, Class B

ICES-003:2016 Issue 6, Class B

ANSI C63.4:2014

The above equipment (Model: FD816CA-HF2) has been tested by **Wendell Electrical Test Laboratory**, and found compliance with the requirement of the above standards. The test record, data evaluation and Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.



1.1 Summary of Test Result

The EUT has been tested according to the following specifications:

Emission				
Standard	Test Item	Limit	Result	Remark
47 CFR FCC Part 15, Subpart B	Conducted disturbance at mains terminals	-	N/A	Without AC power port of the EUT
ICES-003	Radiated disturbance	Class B	Pass	Meets the requirements

Note: Test record contained in the referenced test report relate only to the EUT sample and test item.



2 Test Configuration of Equipment Under Test

2.1 Test Facility

Conducted disturbance at mains terminals Test

W01: Add: 6F/6F-1, No.188, Baoqiao Rd., Xindian Dist., New Taipei City 23145, Taiwan
R.O.C.

Radiated emission Test (OATS)

W03: No.38-20, Mujiliao, Sanzhi Dist., New Taipei City 252, Taiwan (R.O.C.)

ACCREDITATIONS

The laboratories are accredited and approved by the TAF according to ISO/IEC 17025.

2.2 Measurement Uncertainty

The measurement instrumentation uncertainty consideration contained in CISPR 16-4-2.

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$.

2.2.1 Conducted Emission test

Test Site	Measurement Freq. Range	dB (U_{cispr})	Note
W01	150 kHz ~ 30 MHz	3.19	N/A

2.2.2 Radiated Emission test

Test Site	Measurement Freq. Range	Ant	dB (U_{cispr})	Note
W03	30 MHz ~ 200 MHz	V	4.29	N/A
	30 MHz ~ 200 MHz	H	3.35	N/A
	200 MHz ~ 1000 MHz	V	3.87	N/A
	200 MHz ~ 1000 MHz	H	3.48	N/A
	1 GHz ~ 3 GHz	V	4.47	N/A
	1 GHz ~ 3 GHz	H	4.44	N/A
	3 GHz ~ 6 GHz	V	4.86	N/A
	3 GHz ~ 6 GHz	H	4.47	N/A



3 Generation Information

3.1 Description of EUT

Product	Network Camera
Brand	VIVOTEK
Model No.	FD816CA-HF2
Applicant	VIVOTEK INC.
EUT Power Rating	48 Vdc (from POE)
Model Differences	N/A
Operating System	N/A
Data Cable Supplied	N/A
Accessory Device	N/A
I/O Port	Please refer to the User's Manual

Note:

1. The EUT's highest operating frequency is 800MHz. Therefore the radiated emission is tested up to 6GHz.

3.2 Description of Test Modes

Test results are presented in the report as below.

Test Result	Test Condition
Radiated emission 30MHz ~ 1GHz test	
-	POE mode
Radiated emission above 1GHz test	
-	POE mode

3.3 EUT Operating Condition

- a. Placed the EUT on the test table.
- b. Prepared server PC and POE injector to act as a communication partner and placed it outside of testing area.
- c. The EUT was connected to the server PC via LAN cable and POE.
- d. The communication partner sent data to EUT by command "PING" via LAN.
- e. The server PC shows EUT's image on browser.
- f. The EUT write data with micro SD card.

3.4 Description of Support Unit

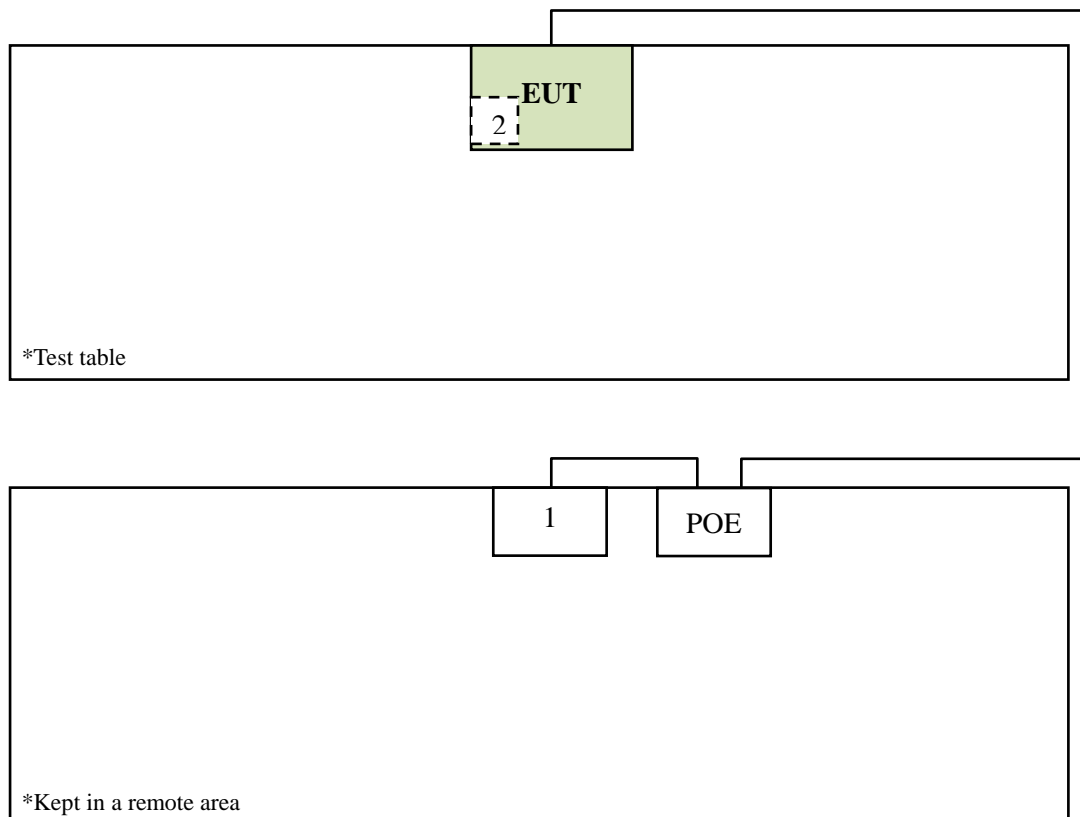
The EUT has been conducted testing with other necessary accessories or support units.

Item	Equipment	Brand	Model No.	Serial No.	FCC ID	Data Cable	Power Cord	Remark
1	Server PC	DELL	OPTIPLEX 380	2C6742S	FCC DoC Approved	1m non-shielded RJ45 cable	1.8m non-shielded cable	-
2	MicroSD Card	ADATA	16GB	N/A	N/A	N/A	N/A	-

- Note:**
1. The core(s) is(are) originally attached to the cable(s).
 2. Item 1 acted as communication partners to transfer data.
 3. The EUT uses the follow POE:

POE Injector (Support unit only)	
Brand	GeoVision
Model	GV-PA481
Input Power	100-240Vac, 2A
Output Power	48Vdc, 1A

3.5 Configuration of System Under Test





4 Emission Test

4.1 Conducted Emission Measurement (Frequency Range 150 KHz-30MHz)

The test is determined no necessary for the EUT do not operate from the power lines or contain provisions for operation while connected to the power lines.



4.2 Radiated Emission Measurement

4.2.1 Limits of Radiated Emission Measurement

Radiated Frequency range 30 MHz to 1000 MHz

Radiated Emissions Limits at 10 meters				
Frequencies (MHz)	FCC 15B/ ICES-003		CISPR 22	
	Class A (dB μ V/m)	Class B (dB μ V/m)	Class A (dB μ V/m)	Class B (dB μ V/m)
30-88	39	29.5	40	30
88-216	43.5	33.1		
216-230	46.4	35.6		
230-960			47	37
960-1000	49.5	43.5		

Radiated Emissions Limits at 3 meters				
Frequencies (MHz)	FCC 15B/ ICES-003		CISPR 22	
	Class A (dB μ V/m)	Class B (dB μ V/m)	Class A (dB μ V/m)	Class B (dB μ V/m)
30-88	49.5	40	50.5	40.5
88-216	54	43.5		
216-230	56.9	46		
230-960			57.5	47.5
960-1000	60	54		

Note: 1. The lower limit shall apply at the transition frequency.

2. Detector function in the form: PK = Peak, QP = Quasi Peak, AV = Average

3. The test result calculated as following:

Measurement Value = Reading Level + Correct Factor

Correction Factor = Antenna factor + Cable loss (Antenna to preamplifier) - preamplifier Gain
+ Cable loss (preamplifier to receiver)

Margin Level = Measurement Value - Limit Value



Radiated Frequency range above 1 GHz

Radiated Emissions Limits at 10 meters						
Frequencies (MHz)	FCC 15B/ ICES-003				CISPR 22	
	Class A (dBµV/m)		Class B (dBµV/m)		Class A (dBµV/m)	Class B (dBµV/m)
	Peak	Average	Peak	Average		
1000-3000	69.5	49.5	63.5	43.5	Not defined	Not defined
Above 3000						

Radiated Emissions Limits at 3meters								
Frequencies (MHz)	FCC 15B/ ICES-003				CISPR 22			
	Class A (dBµV/m)		Class B (dBµV/m)		Class A (dBµV/m)		Class B (dBµV/m)	
	Peak	Average	Peak	Average	Peak	Average	Peak	Average
1000-3000	80	60	74	54	76	56	70	50
Above 3000					80	60	74	54

- Note:**
- The lower limit shall apply at the transition frequency.
 - Detector function in the form: PK = Peak, QP = Quasi Peak, AV = Average
 - The test result calculated as following:
 Measurement Value = Reading Level + Correct Factor
 Correction Factor = Antenna factor + Cable loss (Antenna to preamplifier) - preamplifier Gain + Cable loss (preamplifier to receiver)
 Margin Level = Measurement Value - Limit Value

Frequency Range (For unintentional radiators)

Highest frequency generated or used in the device or on which the device operates or tunes (MHz)	Upper frequency of measurement range (MHz)
Below 1.705	30
1.705-108	1000
108-500	2000
500-1000	5000
Above 1000	5th harmonic of the highest frequency or 40GHz, whichever is lower



4.2.2 Test Instrument

Item	Equipment	Manufacturer	Model	Meter No.	Calibration Date
1	Horn Antenna	Schwarzbeck	BBHA 9120 D	CT-1-001	Apr. 01, 2016
2	Bilog Antenna	Schwarzbeck	VULB 9168	CT-1-002-1	Mar. 30, 2016
3	Test Cable	HARUIN	CFD400NL-LW	CT-1-070	Aug. 02, 2016
4	Preamplifier	EM Electronics Corporation	EM30265	CT-1-013	Aug. 02, 2016
5	Test Cable	HARBOUR	27478 LL142	CT-1-073	Aug. 03, 2016
6	EMI Test Receiver	Agilent	N9038A	CT-1-068	Aug. 02, 2016
7	Measurement Software	Ez-EMC	Ver : FA-03A2 RE	CT-3-012	No calibration request

Note: 1. The calibration interval of the above test instruments is 12 months.



4.2.3 Test Procedure

- a. The EUT was placed on the top of a turntable 0.8 meters above the ground at a 3 m or 10 m open area test site. The table was rotated 360 degrees to determine the position of the high radiation emissions.
- b. The height of the test antenna shall vary between 1 m to 4 m. Both vertical and horizontal polarizations of the antenna were set to make the measurement.
- c. The EUT was set up as per the test configuration to simulate typical usage per the user's manual. All I/O cables were positioned to simulate typical usage. The actual test configuration, please refer to EUT test photos.
- d. The initial step in collecting radiated emission data is a Spectrum Mode scanning the measurement frequency range.

Blow 1GHz:

Reading in which marked as QP or Peak means measurements by using Spectrum Mode with detector RBW=120kHz.

If the Spectrum Mode measured peak value compliance with and lower than Quasi Peak Limit, the EUT shall be deemed to meet QP Limits.

Above 1GHz:

Reading in which marked as Peak & AVG means measurements by using Spectrum Mode with setting in RBW=1MHz.

If the Spectrum Mode measured value compliance with the Peak Limits and lower than AVG Limits, the EUT shall be deemed to meet both Peak and AVG Limits.

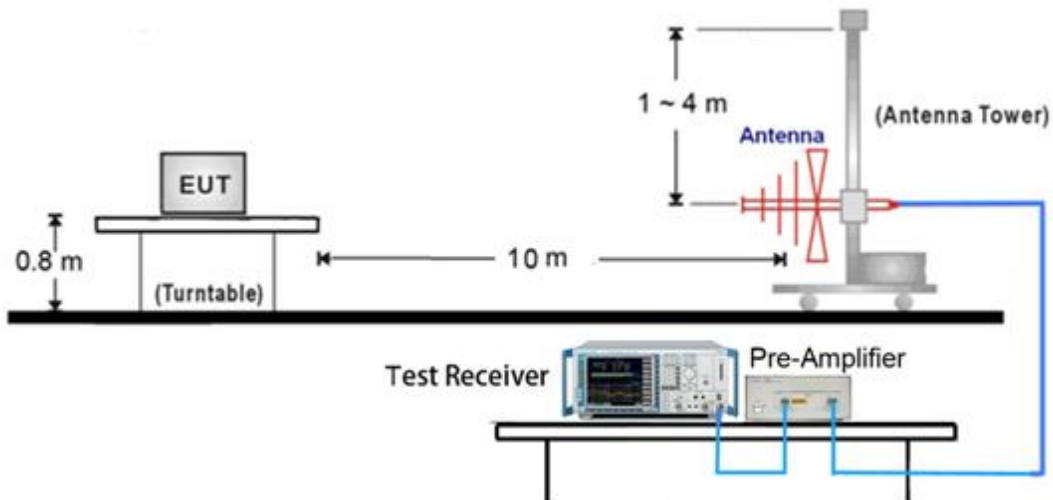
- e. Emission frequency and amplitude were recorded, recording at least six highest emissions. The EUT and cable configuration of the above highest emission levels were recorded. The test data of the worst case was recorded.

4.2.4 Deviation from Test Standard

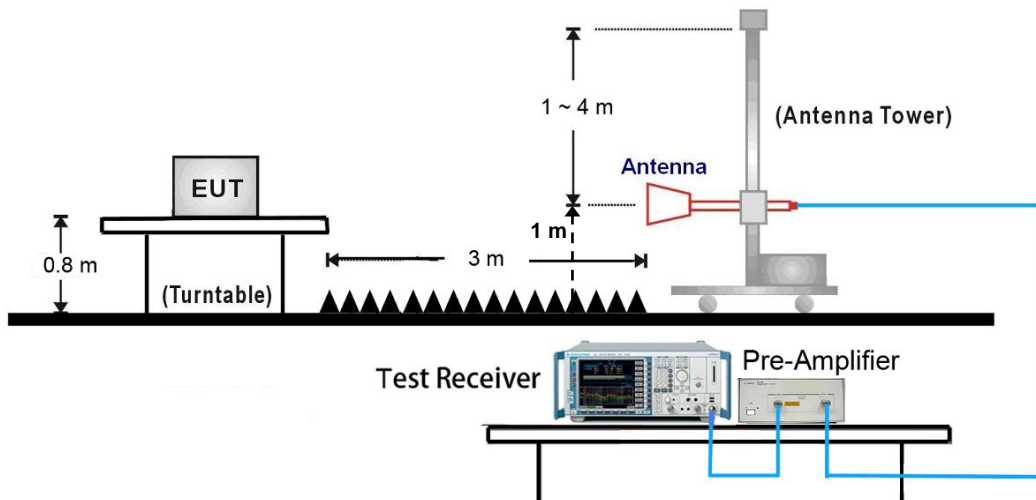
No deviation

4.2.5 Test Setup

< Radiated Emissions Frequency: 30 MHz to 1000 MHz >



< Radiated Emissions Frequency: above 1GHz >



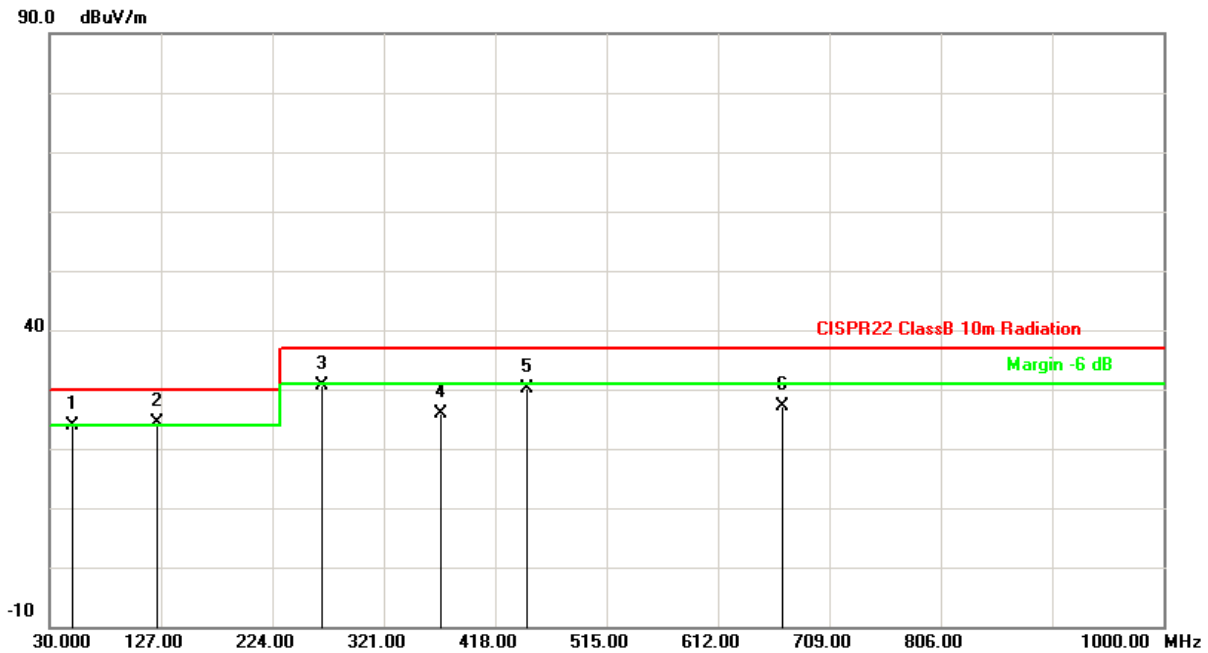
Note:

- (1) Please refer to the 4.2.7 for the actual test configuration.
- (2) The formula of measured value as: $\text{Test Result} = \text{Reading} + \text{Correction Factor}$
- (3) Detector function in the form: PK = Peak, QP = Quasi Peak, AV = Average
- (4) The test result calculated as following:
 $\text{Measurement Value} = \text{Reading Level} + \text{Correct Factor}$
 $\text{Correct Factor} = \text{Antenna Factor} + \text{Cable Loss} - \text{Amplifier Gain (if use)}$
 $\text{Margin Level} = \text{Measurement Value} - \text{Limit Value}$



4.2.6 Test Result

Test Voltage	48Vdc (from POE)	Frequency Range	30 – 1000 MHz
Environmental Conditions	22°C, 63% RH	6dB Bandwidth	120 kHz
Test Date	2016/11/01	Test Distance	10m
Tested by	Evan Cheng	Polarization	Vertical



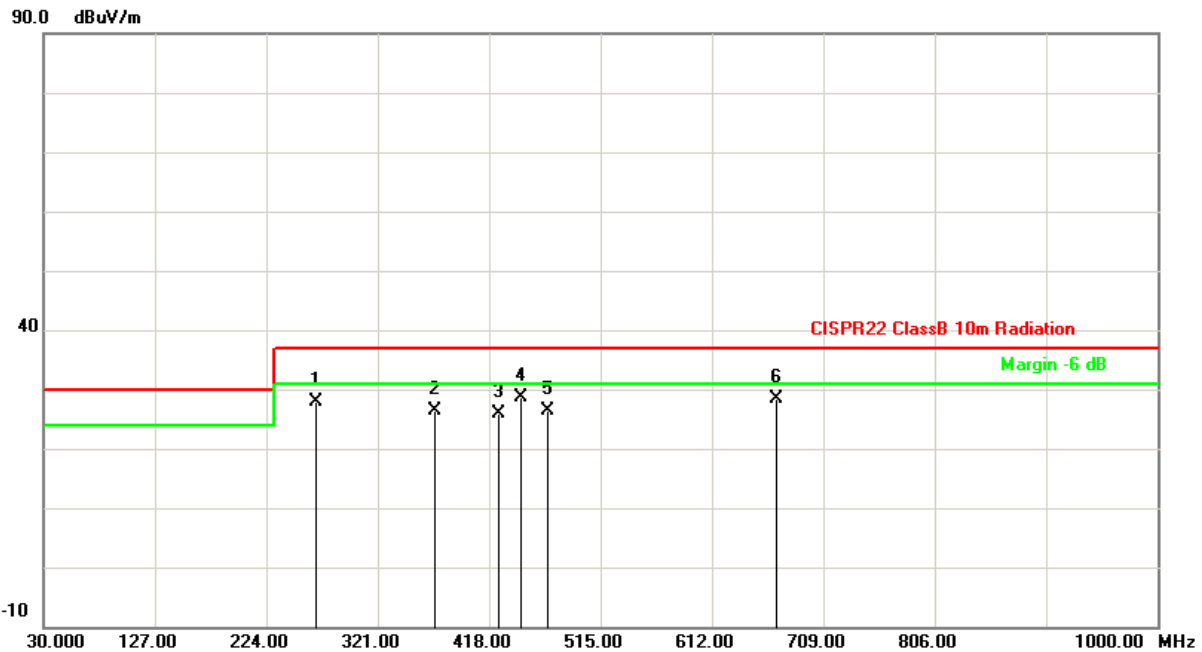
No.	Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB/m)	Measurement (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Degree (degree)
1	50.4160	41.91	-17.93	23.98	30.00	-6.02	QP	100	360
2	124.1900	45.21	-20.93	24.28	30.00	-5.72	QP	100	125
3	267.0000	52.42	-21.75	30.67	37.00	-6.33	QP	100	151
4	371.2600	44.67	-18.84	25.83	37.00	-11.17	QP	100	261
5	445.5150	46.87	-16.65	30.22	37.00	-6.78	QP	100	62
6	668.2600	39.00	-11.89	27.11	37.00	-9.89	QP	100	98

Remark:

1. QP = Quasi Peak
2. Correction Factor = Antenna factor + Cable loss (Antenna to preamplifier) - preamplifier Gain + Cable loss (preamplifier to receiver)
3. Measurement Value = Reading Level + Correct Factor
4. Margin Level = Measurement Value - Limit Value



Test Voltage	48Vdc (from POE)	Frequency Range	30 – 1000 MHz
Environmental Conditions	22°C, 63% RH	6dB Bandwidth	120 kHz
Test Date	2016/11/01	Test Distance	10m
Tested by	Evan Cheng	Polarization	Horizontal

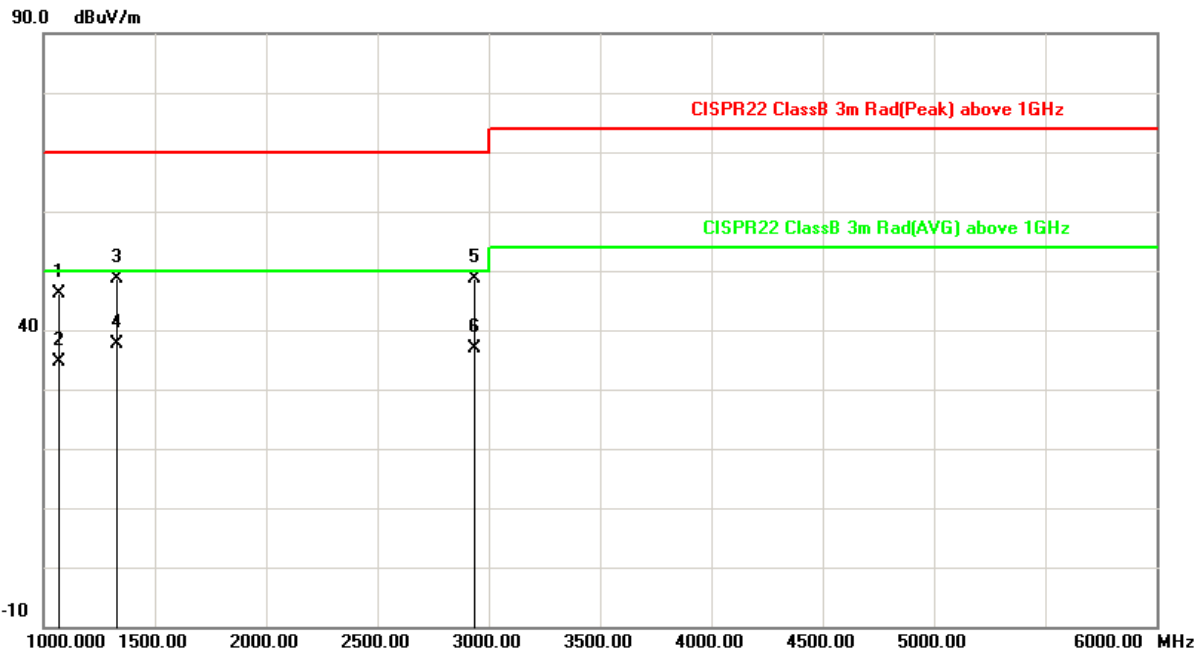


No.	Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB/m)	Measurement (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Degree (degree)
1	267.0000	49.61	-21.75	27.86	37.00	-9.14	QP	400	129
2	371.2515	45.31	-18.84	26.47	37.00	-10.53	QP	346	161
3	427.0000	43.24	-17.24	26.00	37.00	-11.00	QP	189	52
4	445.5100	45.25	-16.65	28.60	37.00	-8.40	QP	187	57
5	469.0000	42.37	-16.05	26.32	37.00	-10.68	QP	186	54
6	668.2550	40.30	-11.89	28.41	37.00	-8.59	QP	187	50

Remark: 1. QP = Quasi Peak
 2. Correction Factor = Antenna factor + Cable loss (Antenna to preamplifier) - preamplifier Gain + Cable loss (preamplifier to receiver)
 3. Measurement Value = Reading Level + Correct Factor
 4. Margin Level = Measurement Value - Limit Value



Test Voltage	48Vdc (from POE)	Frequency Range	1 – 6GHz
Environmental Conditions	22°C, 63% RH	6dB Bandwidth	1MHz
Test Date	2016/11/01	Test Distance	3m
Tested by	Evan Cheng	Polarization	Vertical

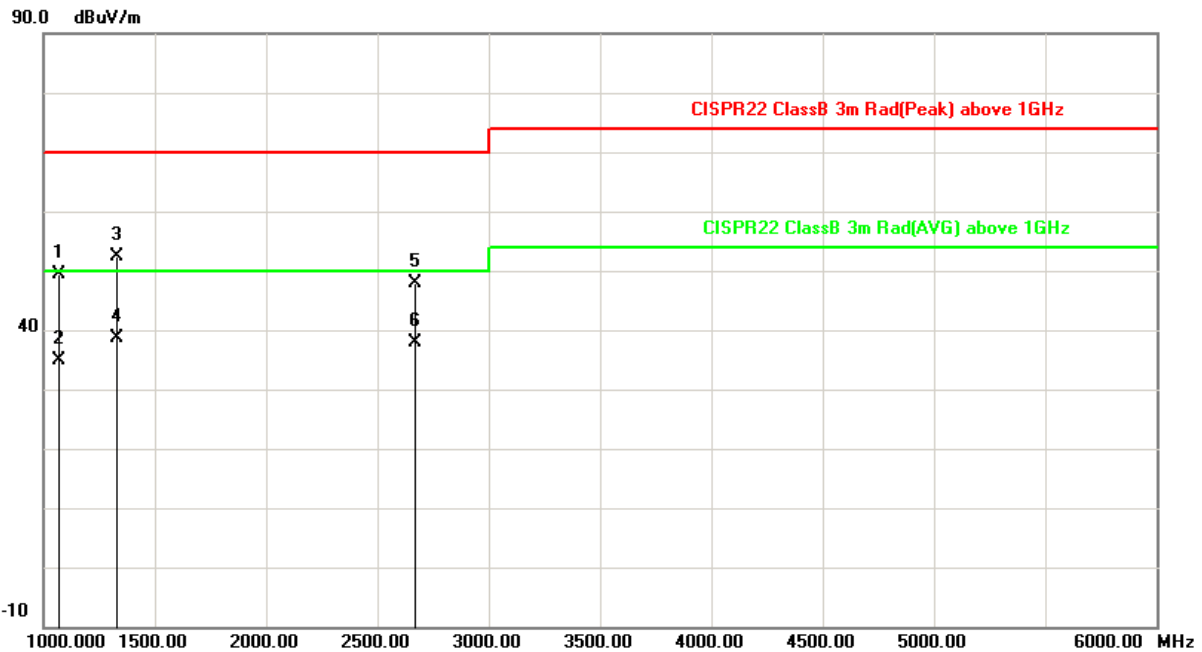


No.	Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB/m)	Measurement (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Degree (degree)
1	1067.000	59.41	-13.36	46.05	70.00	-23.95	peak	100	284
2	1067.000	47.88	-13.36	34.52	50.00	-15.48	AVG	100	284
3	1332.000	59.61	-10.97	48.64	70.00	-21.36	peak	100	276
4	1332.000	48.72	-10.97	37.75	50.00	-12.25	AVG	100	276
5	2937.000	51.62	-2.94	48.68	70.00	-21.32	peak	100	254
6	2937.000	39.77	-2.94	36.83	50.00	-13.17	AVG	100	254

Remark: 1. peak = Peak, AVG = Average
 2. Correction Factor = Antenna factor + Cable loss (Antenna to preamplifier) - preamplifier Gain + Cable loss (preamplifier to receiver)
 3. Measurement Value = Reading Level + Correct Factor
 4. Margin Level = Measurement Value - Limit Value



Test Voltage	48Vdc (from POE)	Frequency Range	1 – 6GHz
Environmental Conditions	22°C, 63% RH	6dB Bandwidth	1MHz
Test Date	2016/11/01	Test Distance	3m
Tested by	Evan Cheng	Polarization	Horizontal

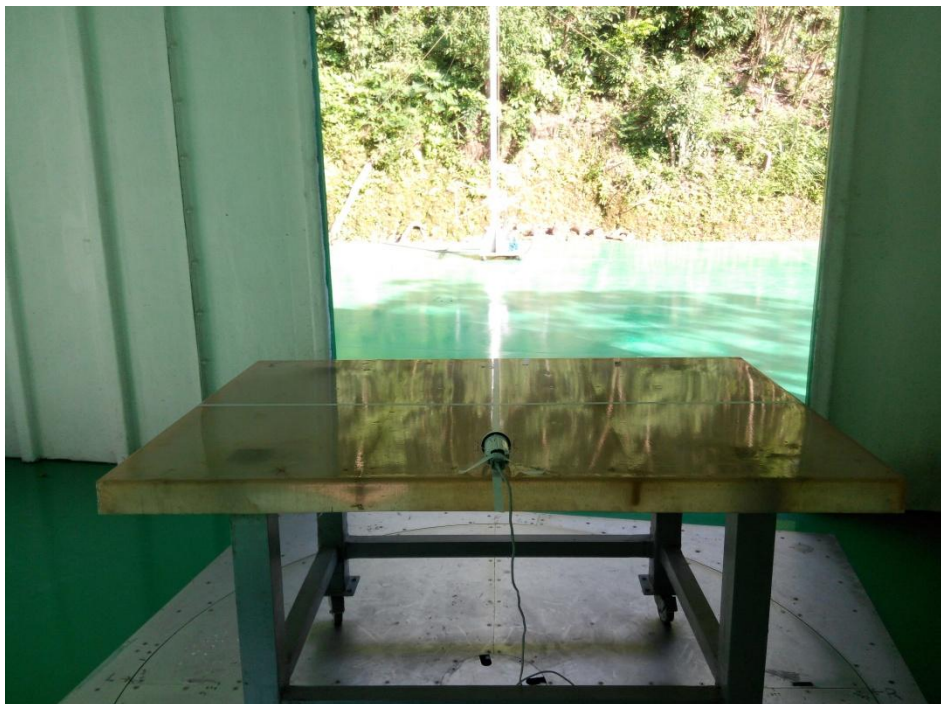


No.	Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB/m)	Measurement (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Degree (degree)
1	1067.000	62.84	-13.36	49.48	70.00	-20.52	peak	100	257
2	1067.000	48.32	-13.36	34.96	50.00	-15.04	AVG	100	257
3	1333.000	63.44	-10.96	52.48	70.00	-17.52	peak	100	341
4	1333.000	49.65	-10.96	38.69	50.00	-11.31	AVG	100	341
5	2667.000	52.12	-4.27	47.85	70.00	-22.15	peak	100	256
6	2667.000	42.12	-4.27	37.85	50.00	-12.15	AVG	100	256

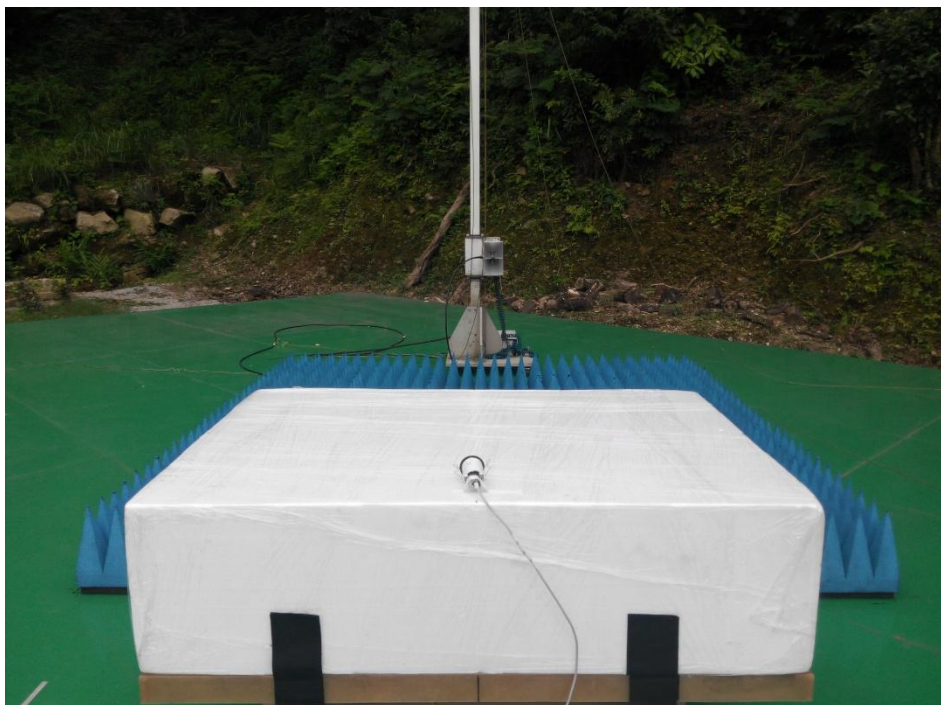
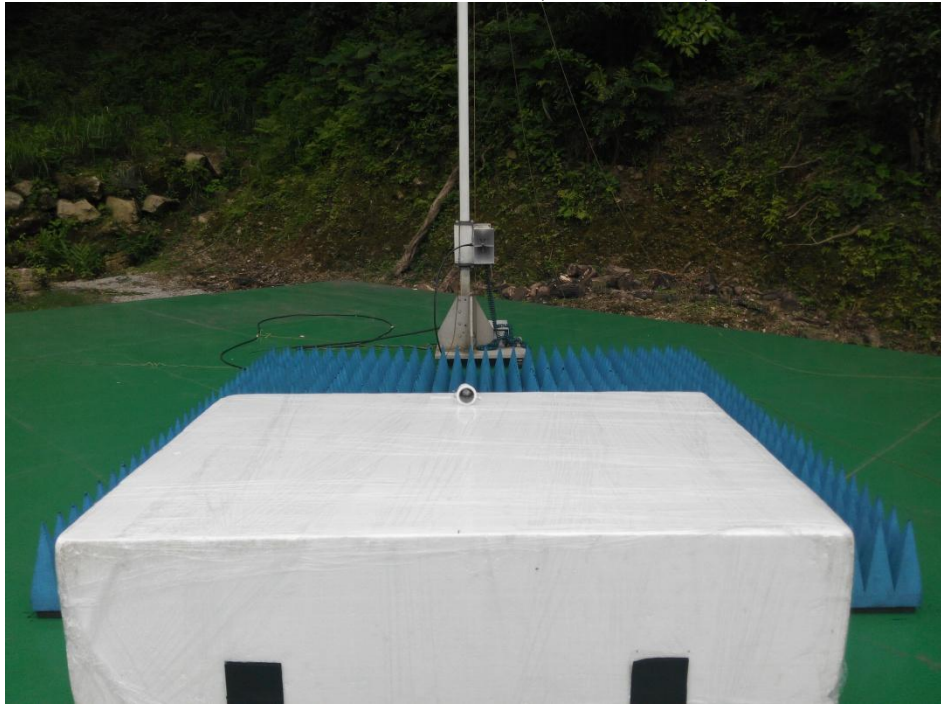
Remark: 1. peak = Peak, AVG = Average
 2. Correction Factor = Antenna factor + Cable loss (Antenna to preamplifier) - preamplifier Gain + Cable loss (preamplifier to receiver)
 3. Measurement Value = Reading Level + Correct Factor
 4. Margin Level = Measurement Value - Limit Value

4.2.7 Photographs of Test Configuration

Radiated Emission Test (30MHz~1GHz)



Radiated Emission Test (Above 1GHz)



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